

ANNA UNIVERSITY CHENNAI
KATHIR COLLEGE OF ENGINEERING, COIMBATORE

DEPARTMENT OF CIVIL ENGINEERING

R2013 REGULATION

PROGRAMME OUTCOMES (POs)

Students graduating from Civil Engineering should be able to:

PO1.Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2.Problem analysis: Identity, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3.Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4.Conduct investigations of complex problems: Use research – based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5.Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in self, and lifelong learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOME (PSOs)

PSO 1: Students shall have skills and knowledge to work on projects on urban and rural housing, infrastructure, environment and sustainability.

PSO 2: Students shall be enriched with professional skills to design structural components in various facets of construction.

COURSE OUTCOMES

III - SEMESTER	
Course code	C201
Subject code	MA 6351
Subject name	TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS
COURSE OUTCOMES	
CO1	Solve the partial differential equations.
CO2	Determine the Fourier series expansion of functions and hence evaluate the value of infinite series.
CO3	Apply the method of separation of variables to solve one dimensional wave equation, one dimensional heat equation and two-dimensional heat equation.
CO4	Find the Fourier transform of functions and also evaluate definite integrals using Fourier transform.
CO5	Calculate the Z-transform of discrete time systems and solve the difference equations using Z-transform.

Course code	C202
Subject code	GE6351
Subject name	ENVIRONMENTAL SCIENCE AND ENGINEERING
COURSE OUTCOMES	
CO1	Understand the interrelationship between living organism and environment.
CO2	Know about the various causes, effect and control measures of environmental pollution.
CO3	Understand the importance of renewable and nonrenewable resources.
CO4	Gain a sound knowledge of latest technological information about the Environmental Management and Legislation Act.
CO5	Implementing scientific, technological, economic and political solutions to Environmental problems related to population.

Course code	C203
Subject code	CE6301
Subject name	ENGINEERING GEOLOGY
COURSE OUTCOMES	
CO1	Explain the importance of geology in civil engineering and the theory of plate tectonics.
CO2	Enumerate the formation of minerals and identify the properties of minerals.
CO3	Illustrate the formation of rocks and differentiate them based on their properties.
CO4	Examine geological maps and identify the geological structures from the maps.
CO5	Design and construction of engineering projects such as dams, tunnels and roads.

Course code	C204
Subject code	CE6302
Subject name	MECHANICS OF SOLIDS
COURSE OUTCOMES	
CO1	Define the fundamental concepts of stresses and strain in mechanics of solids.
CO2	Analysis the beams and to draw shear force and bending moment diagrams.
CO3	Compute the slopes and deflections of determinant beams using different methods.

CO4	Find the stresses and deflections in various shafts and helical springs.
CO5	Analyze trusses to determine the member forces using method of joints, method of sections and estimate the principal stresses and principal planes.

Course code	C205
Subject code	CE6303
Subject name	MECHANICS OF FLUIDS
COURSE OUTCOMES	
CO1	Define fundamental concepts of fluid mechanics including hydro static forces on surfaces, pressure measurement, Buoyancy and floatation.
CO2	Apply Euler's and Bernoulli's equations and the conservation of mass to determine velocities, pressures, and accelerations for incompressible and inviscid fluids.
CO3	Determine flow rates, pressure changes, minor and major head losses for viscous flows through pipes, ducts, simple networks and the effects of pumps, fans, and blowers in such systems.
CO4	Develop the concepts of viscous boundary layers and the momentum intergral and use them to determine intergral thicknesses, wall shear stresses, and skin friction coefficients.
CO5	Make use of principles of dimensional analysis and similitude to simple models using dimensionless parameters.

Course code	C206
Subject code	CE6304
Subject name	SURVEYING I
COURSE OUTCOMES	
CO1	Identify error sources and the procedures to minimize the error.
CO2	Compute the included angles in compass surveying and to convert the field observations into a small-scale map using plane table surveying
CO3	Find the differences in elevation using different methods of levelling.
CO4	Calculate the cross-sectional areas and volumes using contour methods.
CO5	Determine the elevation of the objects.

Course code	C207
Subject code	CE6311
Subject name	Surveying Practical I
COURSE OUTCOMES	
CO1	Gain practical knowledge on handling basic survey instruments
CO2	Gain practical knowledge on handling Theodolite, Tacheometry, Total Station and GPS
CO3	Gain adequate knowledge to carryout Triangulation and Astronomical surveying
CO4	Gain adequate knowledge on general field marking for various engineering projects and Location of site
CO5	After successful completion of the laboratory course, the students will have understood the usage of various surveying equipment and their applications in current practice.

Course code	C208
Subject code	CE6312
Subject name	COMPUTER AIDED BUILDING DRAWING
COURSE OUTCOMES	
CO1	Able to replicate any furnishing details and staircase in reality into a drawing
CO2	Able to create a detailed building plan with elevation and cross sectional elevation
CO3	Understand to use computer software to convey the building drawing
CO4	Able to create building plan for residential building
CO5	Understand the building drawing for industrial building and detailed drawing for framed structure

IV - SEMESTER	
Course code	C209
Subject code	MA6459
Subject name	NUMERICAL METHODS
COURSE OUTCOMES	
CO1	Solve the algebraic, transcendental and system of linear equations.
CO2	Apply the interpolation and approximations in various problems.
CO3	Find the differentiations and integration using numerical tools.
CO4	Determine the solution of initial value problems for ordinary differential equations.
CO5	Determine the solution of boundary value problems in ordinary and partial differential equations.

Course code	C210
Subject code	CE6401
Subject name	CONSTRUCTION MATERIALS
COURSE OUTCOMES	
CO1	Compare the properties of most common building materials such as stones bricks and concrete blocks.
CO2	Interpret the fundamentals of construction materials and mainly focusing on cement, aggregate and mortar.
CO3	Outline the importance of fresh and hardened concrete properties in the construction industry.
CO4	Identify different materials such as plywood, steel and paint for use in various applications in the construction field.
CO5	Explain the typical and potential application of modern construction materials.

Course code	C211
Subject code	CE6402
Subject name	STRENGTH OF MATERIALS
COURSE OUTCOMES	
CO1	define the fundamental concepts of stress energy principles
CO2	analysis of indeterminate beams and use of energy method for estimating the slope and deflections of beams and trusses.
CO3	assess the behaviour of columns, beams and failure of materials.
CO4	find the principal stresses, principal strain and principal planes.
CO5	analyze bending of beams and curved beams

Course code	C212
Subject code	CE6403
Subject name	APPLIED HYDRAULIC ENGINEERING
COURSE OUTCOMES	
CO1	Apply their knowledge of fluid mechanics in addressing problems in open channels.
CO2	solve problems in gradually varied flows in steady state conditions.
CO3	Apply the energy equation and momentum equation for rapidly varied flow.
CO4	analyze the performance of turbines.
CO5	describe the characteristic performance of a centrifugal pump and working principle of reciprocating pumps

Course code	C213
Subject code	CE6404
Subject name	SURVEYING II
COURSE OUTCOMES	
CO1	Explain the different surveying methods.
CO2	Apply corrections and adjust simple triangulation networks.
CO3	Understand total station surveying and its maintenance
CO4	Summarize the working principle, signal structure, components and error sources of GPS
CO5	Understand the fundamentals of route surveying, hydrographic surveying, astronomical surveying, photogrammetry and remote sensing.

Course code	C214
Subject code	CE6405
Subject name	SOIL MECHANICS
COURSE OUTCOMES	
CO1	Determine Index properties, classify the soil and to select the suitable method to compact the particular soil mass.
CO2	Calculate permeability of soil, seepage flow and seepage pressure.
CO3	Understand the stress distribution in soil medium and to make use of Terzaghi's one dimensional consolidation theory to know the settlement characteristics of soil mass.
CO4	Determine shear strength of cohesionless and cohesive soils and its measurement using laboratory methods.
CO5	Identify the stability of infinite and finite slopes by applying the principles of soil mechanics.

Course code	C215
Subject code	CE6411
Subject name	STRENGTH OF MATERIALS LABORATORY
COURSE OUTCOMES	
CO1	Test the steel plate under the action of forces.
CO2	Measure the Steel rod under the action of tensile and shear force.
CO3	Test the wooden specimen under the action of compressive force.
CO4	Conduct experiment on springs for compression and tension.
CO5	Apply the material properties in practice.

Course code	C216
Subject code	CE6412
Subject name	HYDRAULIC ENGINEERING LABORATORY
COURSE OUTCOMES	
CO1	Gain the application of principles performed in experiments
CO2	Measure pipe flows
CO3	Determine the frictional losses in pipes
CO4	Calculate the efficiency and characteristics of Pumps
CO5	Calculate the efficiency and characteristics of Turbines
Course code	C217
Subject code	CE6413
Subject name	Surveying II Laboratory
COURSE OUTCOMES	
CO1	Acquire knowledge about chain and its accessories.
CO2	Understand the traversing, leveling & Plane table concepts.
CO3	Synthesize the boundary of an area by contouring and tachometry.
CO4	Analyze the elevation and distance by single plane and double plane method
CO5	Analyze the topographical map features using total station and GPS

V - SEMESTER	
Course code	C301
Subject code	CE6501
Subject name	STRUCTURAL ANALYSIS I
COURSE OUTCOMES	
CO1	Have knowledge of analysis trusses
CO2	Have an understanding in analysis frames
CO3	Analyse structures for moving loads
CO4	Be aware of basic theory and concepts of structural analysis
CO5	Be exposed to concepts conversant with classical methods of analysis

Course code	C302
Subject code	CE6502
Subject name	FOUNDATION ENGINEERING
COURSE OUTCOMES	
CO1	ability to select type of foundation required for the soil at a place
CO2	able to design shallow foundation
CO3	able to design deep foundation
CO4	impart knowledge on common method of sub soil investigation and design offoundation
CO5	acquires the capacity to investigate the soilcondition and to select and design a suitable foundation.

Course code	C303
Subject code	CE6503
Subject name	ENVIRONMENTAL ENGINEERING I
COURSE OUTCOMES	
CO1	conversant with principles of water supply, treatment anddistribution
CO2	an insight into the structure of drinking water supply systems
CO3	an insight into the structure of water transport,treatment and distribution
CO4	an understanding of water quality criteria and standards, and their relation to public health
CO5	Understand the ability to design and evaluate water supply project alternatives on basis of chosen selection criteria

Course code	C304
Subject code	CE6504
Subject name	HIGHWAY ENGINEERING
COURSE OUTCOMES	
CO1	an overview about the highway engineering with respect to, planning, design
CO2	an overview about the highway engineering with respect to construction and maintenance of highways as per IRC standards, specifications and methods
CO3	have acquired knowledge on planning
CO4	Propose Construction practice including modern materials and methods
CO5	Determine the Pavement Management Systems

Course code	C305
Subject code	CE6505
Subject name	DESIGN OF REINFORCED CONCRETE ELEMENTS
COURSE OUTCOMES	
CO1	introduce the different types of philosophies related to design
CO2	design of basic structuralelements such as slab, beam, column and footing
CO3	Prepare structural systemwith reference to Indian standard code of practice
CO4	Behavior of RC members in bond and Anchorage
CO5	Concept of Elastic method, ultimate load method and limit state method

Course code	C306
Subject code	CE6506
Subject name	CONSTRUCTION TECHNIQUES, EQUIPMENT AND PRACTICE
COURSE OUTCOMES	
CO1	to make the student aware of the various construction techniques, practices and the equipment needed
CO2	have a reasonable knowledge about the various construction procedures for sub to super structure
CO3	have a reasonable knowledge about the equipment needed for construction of various types of structures from foundation to super structure
CO4	have understanding of different construction techniques, practices and equipments
CO5	plan the requirements for substructure and superstructure a construction

Course code	C307
Subject code	CE6674
Subject name	COMMUNICATION AND SOFT SKILLS-LABORATORY BASED
COURSE OUTCOMES	
CO1	Take international examination such as IELTS and TOEFL
CO2	Participate in Group Discussion.
CO3	Successfully answer questions in Interviews and Make effective Presentations.
CO4	Participate confidently and appropriately in conversations both formal and informal
CO5	Communicates effectively in their work places.

Course code	C308
Subject code	CE6511
Subject name	SOIL MECHANICS LABORATORY
COURSE OUTCOMES	
CO1	Determine the index properties of soil
CO2	Learn and acquire knowledge to classify soils
CO3	Understand the techniques, skills and modern engineering tools necessary for engineering practice
CO4	Determine engineering properties and field density of soil
CO5	Understand the behaviour of cohesive and cohesionless soil and the atterberg limits of soil

Course code	C309
Subject code	CE6512
Subject name	SURVEY CAMP
COURSE OUTCOMES	
CO1	Get a basic knowledge about the theodolite and GPS
CO2	Prepare survey reports based on the field survey
CO3	Apply the levelling concepts and prepare contour maps, LS and CS of roads
CO4	Measure the horizontal angles and vertical angles for triangulation work
CO5	Apply the various methods of conventional and advanced surveying techniques and Learn advanced survey instruments survey total station

VI - SEMESTER

Course code	C310
Subject code	CE6601
Subject name	DESIGN OF REINFORCED CONCRETE & BRICK MASONRY STRUCTURES
COURSE OUTCOMES	
CO1	Design of Cantilever and Counterfort Retaining walls
CO2	Design of rectangular and circular water tanks both below and above ground level
CO3	Give an exposure to the design of continuous beams, slabs, staircases, walls and brick masonry structures and to introduce yield line theory
CO4	Determination of collapse load / plastic moment
CO5	Comprehensive design knowledge related to various structural systems

Course code	C311
Subject code	CE6602
Subject name	STRUCTURAL ANALYSIS II
COURSE OUTCOMES	
CO1	Explain the advanced methods of analysis like matrix methods
CO2	Illustrate the analysis like Plastic analysis and FE method
CO3	Determine the functionality of analysis of space structures
CO4	Explain the analysis of Space trusses using method of tension coefficients
CO5	Develop the knowledge on advanced methods of analysis of structures

Course code	C312
Subject code	CE6603
Subject name	DESIGN OF STEEL STRUCTURES
COURSE OUTCOMES	
CO1	Understand the different phases of steel structural member.
CO2	introduce the limit state design of structural steel members subjected to compressive, tensile and bending loads, including connections
CO3	Design of structural systems such as roof trusses, gantry girders as per provisions of current code
CO4	Understand design of laterally supported and unsupported beams
CO5	Learn to implement code knowledge for structural steel member

Course code	C313
Subject code	CE6604
Subject name	RAILWAYS, AIRPORTS AND HARBOUR ENGINEERING
COURSE OUTCOMES	
CO1	Explain the Significance of Road, Rail, Air and Water transports
CO2	Stabilization of track on poor soil & infrastructure for Metro, Mono and underground railways
CO3	Understanding of Air transport characteristics-airport classification-airport planning
CO4	Acquire knowledge on Runway Design: Orientation, Wind Rose Diagram, Runway length
CO5	Acquire knowledge on various techniques of designing Harbor, Port, Satellite Port, Docks, Waves and Tides

Course code	C314
Subject code	CE6605
Subject name	ENVIRONMENTAL ENGINEERING II
COURSE OUTCOMES	
CO1	ability to estimate sewage generation and design sewer system including sewage pumping stations
CO2	understanding on the characteristics and composition of sewage, self-purification of streams
CO3	ability to perform basic design of the unit operations and processes that are used in sewage treatment
CO4	Implement basic knowledge of Construction and Operation & Maintenance of Sewage Treatment Plants
CO5	Understanding of Principles, functions design and drawing of screen, grit chambers and primary sedimentation tanks

Course code	C315
Subject code	CE6002
Subject name	CONCRETE TECHNOLOGY
COURSE OUTCOMES	
CO1	impart knowledge on the properties of materials for concrete
CO2	design procedures for making conventional concrete
CO3	design procedures for making special concrete
CO4	Understand the knowledge related to various test performs on concrete
CO5	Learn to develop Light weight concretes - High strength concrete - Fiber reinforced concrete

Course code	C316
Subject code	CE6611
Subject name	ENVIRONMENTAL ENGINEERING LABORATORY
COURSE OUTCOMES	
CO1	Understand the sampling and preservation methods of waste water
CO2	Understand the significance of characterization of wastewater
CO3	To know about the importance of B.O.D and C.O.D. test of water.
CO4	Understand the ways to determine the suspended, volatile, fixed and settleable solids in wastewater.
CO5	Get aware of hazards due the presence of heavy metals like - Chromium, Lead and Zinc in water.

Course code	C317
Subject code	CE6612
Subject name	CONCRETE AND HIGHWAY ENGINEERING LABORATORY
COURSE OUTCOMES	
CO1	Application of principles performed in experiments
CO2	Measure workability of concrete
CO3	Determine strengths of hardened concrete
CO4	Develop characteristics on bitumen
CO5	After successful completion of the laboratory course the students acquire knowledge on various concrete and bitumen tests

VII - SEMESTER	
Course code	C401
Subject code	CE6701
Subject name	STRUCTURAL DYNAMICS AND EARTHQUAKE ENGINEERING
COURSE OUTCOMES	
CO1	Introduce dynamic loading and the dynamic performance of the structures
CO2	Design based on various types of dynamic loading
CO3	Detailed study on the performance of structures under earthquake loading
CO4	Understanding the Behavior of Reinforced Cement Concrete, Steel and Prestressed Concrete Structure under earthquake loading
CO5	Develop the Earthquake resistant design for masonry and Reinforced Cement Concrete buildings

Course code	C402
Subject code	CE6702
Subject name	PRESTRESSED CONCRETE STRUCTURES
COURSE OUTCOMES	
CO1	Apply systems and methods of prestressing
CO2	Identify the basic assumptions for calculating flexural stresses – Permissible stresses in steel and concrete
CO3	Illustrate fundamental of circuits, cutsets, network flows and graph
CO4	Apply theoretical knowledge of serviceability limit state of deflection & determination of anchorage zone stresses in post-tensioned beams
CO5	Definition, methods of achieving partial prestressing, merits and demerits of partial prestressing

Course code	C403
Subject code	CE6703
Subject name	WATER RESOURCES AND IRRIGATION ENGINEERING
COURSE OUTCOMES	
CO1	Description of water resources planning
CO2	Scope and aims of master plan - Concept of basin as a unit for development
CO3	Estimation of Consumptive use of water
CO4	Design and implement of Impounding structures
CO5	Implement of Irrigation methods: Surface and Sub Surface and Micro Irrigation

Course code	C404
Subject code	CE6704
Subject name	ESTIMATION AND QUANTITY SURVEYING
COURSE OUTCOMES	
CO1	Develop the ability to estimate the quantities of item of works
CO2	Develop the ability to do rate analysis, valuation of properties
CO3	Preparation of reports for estimation of various items
CO4	Make specifications and prepare tender documents
CO5	Drafting of contract documents & Arbitration and legal requirements

Course code	C405
Subject code	CE6007
Subject name	HOUSING PLANNING AND MANAGEMENT
COURSE OUTCOMES	
CO1	To have a comprehensive knowledge of planning, design, evaluation, construction and financing of housing projects
CO2	Focuses on cost effective construction materials and methods
CO3	Emphasis is given on the principles of sustainable housing policies and program
CO4	Plotted land development programs, Open Development Plots, Apartments, Gated communities, Townships, Rental Housing, Co-operative Housing, Slum Housing Program
CO5	Cash Flow Analysis, Subsidy and Cross Subsidy-Public Private Partnership Projects

Course code	C406
Subject code	EN6501
Subject name	MUNICIPAL SOLID WASTE MANAGEMENT
COURSE OUTCOMES	
CO1	To identify Sources and types of municipal solid wastes -waste generation rates-factors affecting generation
CO2	Methods of sampling and characterization; Effects of improper disposal of solid wastes
CO3	Evaluate the methods of Residential and commercial waste collection
CO4	Physical Processing techniques and Equipments; Resource recovery from solid waste composting and bio methanation; Thermal processing options
CO5	Understanding of the nature and characteristics of municipal solid wastes and the regulatory requirements regarding municipal solid waste management

Course code	C407
Subject code	CE6711
Subject name	COMPUTER AIDED DESIGN AND DRAWING LABORATORY
COURSE OUTCOMES	
CO1	Gain knowledge and insight on Design and drawing of RCC cantilever and counter fort
CO2	Gain knowledge and insight on Design of solid slab and RCC Tee beam bridges
CO3	Gain knowledge and insight on Design and drafting of circular and rectangular RCC water tanks
CO4	Gain knowledge and insight on Design of plate Girder Bridge and truss girder bridge
CO5	Gain knowledge and insight on Design of hemispherical bottomed steel tank

Course code	C408
Subject code	CE6712
Subject name	DESIGN PROJECT
COURSE OUTCOMES	
CO1	To impart and improve the design capability of the student
CO2	To train students on design report preparation
CO3	To train students to present the report in front of the experts committee
CO4	To train students to handle any kind of practical difficulties during their future endeavor
CO5	To train students to attend viva-voce presentation

VIII - SEMESTER	
Course code	C410
Subject code	MG6851
Subject name	PRINCIPLES OF MANAGEMENT
COURSE OUTCOMES	
CO1	Knowledgethe evolution of Management
CO2	Study the functions andprinciples of management
CO3	Learn the application of the principles in an organization
CO4	Able to have clear understanding of managerial functions
CO5	Basic knowledge on international aspect of management

Course code	C411
Subject code	CE6016
Subject name	PREFABRICATED STRUCTURES
COURSE OUTCOMES	
CO1	Impart knowledge on modular construction, industrialized construction
CO2	Impart knowledge on design of prefabricated elements and construction methods
CO3	Design of the prefabricated elements
CO4	Knowledge of the construction methods in using prefabricated elements
CO5	Equivalent design loads for considering abnormal effects such as earthquakes, cyclones

Course code	C412
Subject code	CE6021
Subject name	REPAIR AND REHABILITATION OF STRUCTURES
COURSE OUTCOMES	
CO1	Gain the knowledge on quality of concrete, durability aspects, causes of deterioration
CO2	Gain the knowledge on assessment of distressed structures, repairing of structures
CO3	Understanding of Strength, Durability and Thermal properties, of concrete
CO4	Apply the knowledge of Non-destructive Testing Techniques, Epoxy injection, Shoring, Underpinning, Corrosion protection techniques
CO5	Strengthening of Structural elements, Repair of structures distressed due to corrosion, fire, Leakage, earthquake

Course code	C413
Subject code	CE6811
Subject name	PROJECT WORK
COURSE OUTCOMES	
CO1	Demonstrate the technical skills acquired to provide feasible solutions for real-life problems with ethical values
CO2	Plan various interdisciplinary projects to meet the societal needs
CO3	Incorporating mathematical techniques in various fields for solving Civil Engineering problems
CO4	Manage to communicate efficiently and collaboratively work in peer groups to develop optimized hardware/software solutions
CO5	Enhance the management skills to achieve the project goal by working as a team and technical writing skills without plagiarism